REMARKS

Claims 16 and 19 -24 are presently pending. In the above-identified Office Action, the Examiner rejected Claims 16 and 19 -21 under 35 U.S.C. § 102(b) as being anticipated by Meyer, Jr. (US 6167067). Claims 22 – 24 were rejected under U.S.C.103(a) as being unpatentable over Meyer, Jr.

Claims 16, 22, and 23 are amended, and new claims 25 and 26 are presented for consideration. The specification is amended to update references to a related application.

Submitted herewith are four sheets of formal drawings. Additionally submitted herewith are an Information Disclosure Statement, Fee Transmittal, and copies of references cited during examination of a related application in Europe.

By this Amendment, Claims 16 is amended to further distinguish the invention from the cited prior art, and Claims 22 and 23 are amended for consistency with the terminology of Claim 16. Support for the amended Claim 16 can be found in the specification at page 6, lines 1 – 19. Support for the new claims 25 and 26 can be found in the specification at page 7, line 24, to page 8, line 2, and at page 7, lines 12 -14, respectively. For the reasons set forth more fully below, Applicant respectfully submits that the subject application properly presents claims patentable over the prior art. Accordingly, reconsideration, allowance and passage to issue are respectfully requested.

The invention disclosed and claimed in the subject Application addresses the need in the art for a system or method for efficient generation of pulsed tunable laser output in the 2.5 – 4.0 micron region. The invention is set forth in claims of varying scope of which Claim 16 is illustrative. Claim 16 recites:

16. An optical parametric oscillator comprising:
a crystal adapted to
receive pump energy at a first wavelength,
convert said pump energy to energy at both a primary signal wavelength and a primary idler wavelength by means of a primary process, and
convert said energy at a primary signal wavelength to energy at both a second signal wavelength and second idler wavelength by means of a cascaded secondary process; and
a mechanism disposed in functional alignment with said crystal for containing said energy at the primary signal wavelength and enhancing said secondary process thereby, said mechanism including first and second mirrors, both of said mirrors being highly reflective at said primary signal wavelength, and at least one of said mirrors being at least partially transmissive to energy at said second signal wavelength.

None of the references, teach, disclose or suggest the invention as presently claimed. That is, none of the references, taken alone or in combination, teach, disclose or suggest an arrangement comprising a single crystal adapted to convert energy from a first wavelength through an intermediate pair of signal and idler wavelengths to a second pair of signal and idler wavelengths and a resonator comprised of mirrors that contain the energy at the intermediate (primary) signal wavelength and enhance the efficiency of the conversion to the secondary signal wavelength.

In the above-identified Office Action, the Examiner cited Meyer, Jr. (Meyer). Meyer teaches a different optical parametric oscillator (OPO) construction optimized to convert energy from a pump wavelength (typically 1.06 microns) to a wavelength near 4 microns. The invention of Meyer comprises a Periodically Poled Lithium Niobate (PPLN) piece having a grating pitch of 28.3 microns in series with a grating pitch of 32.22 microns within a single resonator. The first grating region serves as an OPO that converts the pump energy to energy at primary signal (1.46 micron) and idler (3.95 micron) wavelengths. The second grating region serves as a difference frequency mixer (DFM) that converts the primary signal energy to additional energy at the primary idler wavelength plus energy at a secondary signal wavelength (2.3 micron). The PPLN is not a crystal in the normal usage of that word, but is more a man-made pseudo-crystal. Note that the combination of an OPO with a DFM using two separate natural crystals is shown as prior art in Figures 1 and 2 of '067.

The two-mirror resonator of Meyer is specifically designed to optimize conversion to the 3.95 micron idler wavelength. Note that efficient conversion to the idler wavelength only occurs when the first and second gratings are exactly phase matched by means of temperature tuning (see column 9, lines 43-58, and Figure 9).

The attached chart compares the claims of the present application (paraphrased in most cases) with the disclosure of Meyer, Jr. Clearly, Meyer, Jr. does not anticipate the use of single crystal adapted to provide both primary and secondary conversion processes, and does not anticipate the claimed features of the two resonator mirrors. Thus applicant submits that Claim 16, as amended, and the claims depending from Claim 16 are allowable.

Accordingly, reconsideration, allowance and passage to issue are respectfully requested.

Respectfully submitted,
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Present Application	Meyer, Jr. (U.S. 6,167,067)

Claim 16:
• A single crystal adapted to convert energy from a pump wavelength to a primary pair of signal and idler wavelengths and then convert the energy from the first signal wavelength to energy at a second pair of signal and idler wavelengths. (Either one of the second pair of wavelengths may be considered the output signal wavelength, and neither is equal to the first idler wavelength.)
 	
• Means comprised of two mirrors.
  o Both mirrors are highly reflective at the primary signal wavelength.
  o At least one mirror is partially transmissive at the second signal wavelength.
	• Conversion from the pump energy to the first pair of signal and idler wavelengths occurs in a first grating region or crystal. Conversion from the first signal wavelength to a second signal wavelength plus additional energy at the first idler wavelength occurs in a <u>second</u> grating region or crystal. First and second idler wavelengths must be the same (3.95u) for the Difference Frequency Mixing process in the second crystal to be efficient.
	
	• Resonator is comprised of two mirrors.
	  o Only one mirror is highly reflective at the primary signal wavelength (1.46u). Second mirror has 10% transmission at 1.46u.
	  o One mirror is highly reflective and the other highly transparent at the first idler wavelength, which is <u>not</u> the second signal wavelength. Mirror characteristics at the second signal wavelength are not disclosed.

Claim 19. • Crystal is X cut	• The disclosure is limited to PPLN, which is a man-made structure. The terms X-cut and Y-cut are only relevant to natural crystal such as potassium titanyl arsenate. The only reference to natural crystals occurs in the last paragraph of column 1 which is a discussion of the prior art.
Claim 20. • Crystal is Y cut.	
Claim 21. • Crystal is potassium titanyl arsenate.	
Claim 22 • Second signal wavelength is approximately 2.59 microns	• Output wavelength is at the primary idler wavelength (about3.95 microns) only.
Claim 23 • Second signal wavelength is approximately 3.76 microns	
Claim 24 • Angle tunable	• May be temperature or "periodically" tuned. No disclosure of angle tuning except in the discussion of prior art.
Claim 25 • Both mirrors are highly transparent at the primary and second idler wavelengths	• One mirror is highly reflective at the primary/secondary idler wavelength
Claim 26 • One mirror is highly reflective at the second signal wavelength	• No teaching on the mirror characteristics at the second signal wavelength.